Guiding of Visible Light Using a Lithographically Patterned Bragg Fiber

J.G. Fleming, M. C. Phillips, D.L. Luck and G. Ronald Hadley
Sandia National Labs, Org 1749, Albuquerque, New Mexico, USA

Here we present our results on the guiding of visible light using Bragg fibers. In our approach the waveguides are patterned lithographically, enabling a wide variety of different waveguide, bend and splitter configurations. The mirrors were fabricated by depositing alternating layers of silicon nitride and silicon dioxide. The midpoint of the bandgap was targeted at 400nm. These proof of concept structures were relatively large, 15-30 microns in diameter and multimode. The fibers were tested in a number of ways. Initially, a novel, rapid, screening approach was investigated using an optical microscope integrated with an image capture system. It is possible to obtain from the image file the relative intensities of the red, blue and green components from the fiber and the light source in surprisingly fine detail. More detailed optical experiments involved measuring transmission spectra of four fiber lengths, as well as imaging the fiber output. The light source was a quartz tungsten halogen lamp and monochromator, coupled in and out of the Bragg fiber using microscope objectives. The transmitted light was detected with a photomultiplier tube for transmission spectra or with a CCD array for near field images. Certain modes appear to have sufficiently low loss to be useful.

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